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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/764,523	01/18/2001	Kiyoshi Satoh	ASMJP.055AUS	6412

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EXAMINER	
WINTER, GENTLE E	
ART UNIT	**PAPER NUMBER**
1746	

DATE MAILED: 10/22/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/764,523	SATOH ET AL.	
	Examiner	Art Unit	
	Gentle E. Winter	1746	

-- The MAILING DATE of this communication appears on th cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 September 2003* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *33-45* is/are pending in the application.

4a) Of the above claim(s) *41-44* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *33-38 and 40* is/are rejected.

7)☒ Claim(s) *39* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Response to Arguments

1. Applicant has argued:

> Applicants respectfully traverse the rejections and submit that Shang et al. does not teach each and every feature of independent Claim 33. Specifically, Shang et al. does not disclose the etch rate of greater than or equal to about 2.0 microns/minute in combination with the other claim limitations. The Office Action states that "inherently the rate of removal will also be the same, even if the same is not identically disclosed." Applicants submit that this finding is not only unsupported by Shang et al. but is actually directly contradicted by Shang; et al. As noted by the Examiner, Shang et al. does teach a microwave source that is capable of delivering power in the range of 3,000-12,000 Watts (column 5, lines 11-13), and Applicants do not dispute that this teaching meets Applicants' limitation of "applying energy with a power of less than about 3,000 W." This does not, however, mean that applying 3,000 W to the apparatus of Shang et al. would meet the limitation of "removing ... at a rate of greater than or equal to about 2.0 microns/minute."

2. To summarize, Applicant does not dispute that the prior art of record discloses the method steps. Applicant concedes that the prior art discloses all the steps that are actively performed, but Applicant obtains a different result. In essence, Applicant distinguishes the instant claim based solely on the result obtained. Claim 33 does not disclose what substrate is etched at "2.0 microns per minute". Allowing the pending claim 33 to issue would have the effect of allowing Applicant to prevent the patent holder from practicing the disclosed process on any adhered deposit where the removal rate is 2.0 microns per minute or greater.

3. It is noted that Applicant further fails to disclose flowrate, pressure, and temperature in claim 33, and fails to disclose the size of the remote chamber. As to the argument that Shang et al. also clearly implies that lower power will lead to lower etch rates, this Examiner agrees. In fact, figure 2 of Shang et al. shows the correlation between NF3 dissociation and applied power. The optimum range appears to be between about 2,300W and 4,100W. Applicant may want to include limitations in claim 33 that result in the improved etch rate, which are disclosed in the

specification. The current claim discloses only known steps and recites results that would inherently follow.

With respect to claim 38, it was not clear where the valve is positioned from claim 38, Applicant is thanked for the clarification. Applicant acknowledges that there is a valve, but argues that the valve is not disclosed to be opened or closed. The figure makes it clear that there are two modes of operation, the illustrated mode is operating to using the gas in **32**. No gas flows through **59**.

Claim Rejections - 35 USC § 102--Maintained and Withdrawn in Parts

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claim 33-35, 37-40, and 45 are rejected under 35 U.S.C. 102(b) as being anticipated by United States Patent No. 5,788,778 to Shang et al.

3. Specifically, claim 33 is drawn to a method of cleaning a chemical vapor deposition (CVD) reaction chamber with cleaning gas provided through a remote plasma discharge chamber. The method comprising the steps of dissociating cleaning gas within the remote plasma discharge chamber. Disclosed by Shang as a "remote activation chamber. See e.g. column 5, line 8 *et seq.*

4. Claim 33 further discloses applying energy with a power of less than about 3,000 Watts. Shang discloses "about 3,000-12,000 Watts". See e.g. column 5, line 8 *et seq.* Claim 33

discloses supplying activated species from the remote plasma discharge chamber to the reaction chamber through a piping and removing adhered deposits from CVD reactions on a wall of the reaction chamber at a rate of greater than or equal to about 2.0 microns/minute. Figure 1 of Shang discloses the pipe and because each and every limitation in the claim is present in Shang, inherently the rate of removal will also be the same, even if the same is not identically disclosed. Applicant argues that the rate is disclosed as 1 micron per minute and as such the claim is not anticipated.

5. As to claim 34, disclosing that the deposits on the reaction chamber wall comprise silicon nitride. The same is disclosed in Shang at see e.g. column 6, line 12.

6. As to claim 35, disclosing that the cleaning gas comprises fluorine-containing gas and the activated species comprises fluorine active species. The same is disclosed in Shang at see e.g. column 6, line 12. Specifically NF_3.

7. As to claim 37, disclosing that supplying activated species comprises flowing NF_3 through the remote plasma discharge chamber at a rate between about 0.5 slm and 1.5 slm. Shang discloses the NF_3 at e.g. column 6, line 12 and the flowrate at see e.g. column 5, line 9 *et seq.* It is noted that "about 2" is read to include the claimed "about 1.5", if applicant prefer a different reading applicant is requested to make the record clear as to how applicant would like "about" to be construed.

8. As to claim 38, disclosing opening a valve on the piping after conducting a CVD reaction and prior to supplying activated species. The same is disclosed at see e.g. column 5, line 15 *et seq.* especially at line 23 *et seq.*

9. As to claim 40, further limiting claim 38, reciting the step of closing the valve after removing the adhered deposits. This is discloses at column 5, line 15 *et seq.* and is consistent with all known cleaning procedures.

10. As to claim 45, disclosing that the power supplied is between 2,000 and 3,000 Watts, Shang discloses "about 3,000-12,000 Watts". See e.g. column 5, line 8 *et seq.*

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claim 36 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shang, as discusses above and United States Patent No. 5,844,195 to Fairbairn et al (Fairbairn).
Each and every limitation of claim 36 is disclosed in Shang as set forth above, except that Shang fails to explicitly disclose that the applied energy has a frequency between about 300 kHz and 500 kHz. Fairbairn discloses the missing element and explicitly provides the motivation for making the instant combination. Specifically Fairbairn discloses that "[i]n the dry cleaning

process, *** with regard to the RF power source, any of a wide range of frequencies (e.g., 400 KHz to 13.56 MHz) are typically used to generate plasmas". Fairbairn goes on to disclose: "In general, however, it should be understood that the power levels, flow rates, and pressure that are chosen are system specific and thus the will need to be optimized for the particular system in which the process is being run. Making the appropriate adjustments in process conditions to achieve optimum of performance for a particular system is well within the capabilities of a person of ordinary skill in the art.

Allowable Subject Matter

4. Claim 39 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Applicant posits that the needle valve "does not meet the limitation of claim 39." Applicant's argument is accepted. The needle valve does not allow for the withdrawal of a sealing element. Page 8, in the paragraph starting at line 6 discloses:

> While being brought into the reaction chamber where film formation is performed through a conduit, generated fluorine active species returns to molecules by colliding with the valve that restricts the flow by narrowing a passage, or it is deactivated by reacting with the valve surface. As a result, the amount of fluorine active species declines. Similarly, if piping from the second plasma discharge chamber to the reaction chamber is too long or bends at an acute angle, due to higher contact probability with the piping surface en route or by colliding with the corner portion of the bent piping, the amount of fluorine active species decreases. Decreased fluorine active species lowers the cleaning rate within the downstream deposition chamber and results in insufficient cleaning.

5. The prior art of record does not appear to appreciate that the etch rate may be improved reducing the collisions between the species source and the product to be etched by changing the valve type.

Conclusion

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Gentle E. Winter whose telephone number is (703) 305-3403. The examiner can normally be reached on Monday-Friday 7:00-3:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Randy P. Gulakowski can be reached on (703) 308-4333. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications. The direct fax number for this examiner is (703) 746-7746.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Gentle E. Winter
Examiner
Art Unit 1746

October 20, 2003

RANDY GULAKOWSKI
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700